Annotated Bibliography of Aquaculture and Marine Resource Development Studies: 1997- 2003

Prepared for Land and Water BC Inc.

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PREFACE

This annotated bibliography is a listing of studies prepared by and for government, communities and economic development organizations since 1997. The studies included are intended to provide the reader with access to documents that will enable them to gain a broad, clear perspective on the potential for economic development of the aquaculture and marine resource sectors for the coastal communities of BC. The bibliography serves as a framework on which to build a more comprehensive compilation of information. This is only a beginning.

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FISHERIES and AQUACULTURE DEVELOPMENT

Federal Government Reports

AQUACULTURE IN CANADA'S ATLANTIC AND PACIFIC REGIONS
Prepared by The Standing Senate Committee on Fisheries, Interim Report
June 2001.

Report published from the findings of the Committee on the current issues facing the fisheries and the specific challenges and constraints facing the marine aquaculture sector in the Atlantic and Pacific regions. Issues addressed include: the role of DFO and support of aquaculture development; employment and economic development; siting of fish farms; environmental concerns about salmonid aquaculture; fish health; shellfish aquaculture enhancements; and science, research and development.

THE EFFECTS OF SALMON FARMING IN BRITISH COLUMBIA ON THE MANAGEMENT OF WILD SALMON STOCKS,
Report of Auditor General of Canada to Fisheries and Oceans Canada,
December 2000.

This is the third audit report since 1997 on DFO Pacific salmon management programs. The first audit in 1997 examined DFO management of the resource base; the second in 1999, addressed DFO management of salmon fisheries. The focus of this audit is DFO management of wild salmon stocks and whether the department is meeting its obligations under the *Fisheries Act* in the regulation of the salmon farming industry in BC. The results of the audit suggest that DFO is not fully meeting its legislative obligations and has not developed a plan to evaluate and manage the risks of salmon farming on wild stocks. It urges the Department to address these and other shortcomings in consultations with the Province to ensure the co-existence of sustainable salmon fishing with farming industry is achieved.

PARTNERING THE FISHER, Report of the Panel Studying Partnering
Prepared by Donald J. Savoie, Chair, Gabriel Filteau, Patricia Gallaugher
For Fisheries and Oceans Canada, December 1998

Panel was established in 1998 by the Minister of Fisheries and Oceans to advise DFO on proposed partnering provisions for the new *Fisheries Act*. Within 3 months the panel visited all regions of Canada to meet with communities and fisher groups in a consultative process. The panel concluded that: DFO reshape management methods and policies in order to build trust and invite greater participation from local levels to help identify and resolve issues; the federal government provide funding and supports to communities to help build capacity to meet those changes; DFO and its partners promote a transparent approach to guide development and implementation of all future co-management or partnering agreements; establish a flexible time-frame in co-management agreements; DFO review and coordinate efforts to develop a community-based management approach. Background on issues and recommendations on how to proceed are presented.

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Provincial Government Publications and Reports

2ND ANNUAL INSPECTION REPORT ON MARINE FINFISH AQUACULTURE SITES
Prepared by BC Ministry of Agriculture, Food and Fish, Aquaculture Licensing and Compliance Branch, Resource Development and Sustainability Division, Victoria, BC
February 2002.

Report reviews the mandate of the Ministry of Agriculture, Food and Fish as it relates to aquaculture development and the responsibilities of the Ministry for licensing and compliance of commercial seafood farming operations. MAFF provides an evaluation of the first inspection cycle and outlines compliance and enforcement activities following the introduction of more stringent requirements in October 2000 to regulate farming practices. Appendices include: list of companies inspected, site inspection checklist, reference websites, licensing policies and procedures.

THE 2001 BRITISH COLUMBIA SEAFOOD INDUSTRY IN REVIEW, Poised For Growth
Prepared by BC Ministry of Agriculture, Food and Fish, Seafood Development Branch, Victoria, BC, 2001.

Published every 2 years this report provides an updated assessment on the commercial fishing, aquaculture and seafood processing sectors. Included is a synopsis on seafood production, industry competitiveness, fisheries and aquaculture management and environmental sustainability and, resource development. BC Fisheries previously produced this series of publication.

BRITISH COLUMBIA'S FISHERIES & AQUACULTURE SECTOR
Prepared by BC STATS, Ministry of Finance and Corporate Relations, Victoria, BC
May 2001.

This second statistical report follows previously published information on commercial fisheries, aquaculture, fish processing and sport fishing. Highlights of the findings in the report suggest future growth. BC fisheries and aquaculture sector generated $529 million to the province's GDP in 1999. Slower growth of fisheries and aquaculture reflect in part, a general shift in the economy away from goods production to service industries. Commercial fishery and fish processing industries saw substantial declines since the mid 90's as the salmon catch fell to historic lows and aquaculture was the only industry that was unaffected by the decline. Employment in the fisheries and aquaculture sector totalled 15,000 jobs in 2000 however employment has fallen since 1984 largely due to fewer people working in the commercial fishery and fish processing industries. The strength of the aquaculture sector helped boost industry overall performance during the 90's; fisheries and aquaculture revenue totalled $1.7 billion in 1999.

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BRITISH COLUMBIA'S FISHERIES AND AQUACULTURE SECTOR,
Prepared by BC STATS, Ministry of Finance and Corporate Relations Victoria, BC
February 2000.

This first report assessed the overall size and economic impact of the fisheries and aquaculture sector relative to other industries and resource sectors and, identified emerging trends. This provided the ability to measure the performance of fisheries and aquaculture against the rest of the economy to present a better understanding of long-term prospects for the sectors.

THE 1999 BRITISH COLUMBIA SEAFOOD INDUSTRY IN REVIEW,
Prepared by BC Fisheries, Victoria, BC, June 1999.

The eighth and final issue published by BC Fisheries. Provides an overview assessment and highlights activities in the seafood industry from 1997-1999. Includes information on sector development, changes in policies and introduction of programs with a look ahead to 2000.

SALMON AQUACULTURE REVIEW SUMMARY,
Environmental Assessment Office, Victoria, BC, 1997.

Comprehensive review of the environmental risks associated with salmon farming. Recommendations included in the report represented a shift to a clear, objective regulatory system with standards of enforcement to prevent or reduce potential adverse environmental impacts and conflicts with other resource users. Includes 46 recommendations on salmon farm siting, escaped farm salmon, farm and wild fish health, waste discharges, interactions with coastal mammals and other species, First Nations issues, managing risk and uncertainty, dispute avoidance and resolution, implementation.

SALMON AQUACULTURE REVIEW, BIBLIOGRAPHIC LISTINGS, Volume 5
Environmental Assessment Office, Victoria, BC, August 1997.

Listings of publications from 1980 to 1996 relevant to the Salmon Aquaculture Review study and important to the review process also, and specific issues identified in the terms of reference. Bibliographic listings include publications by BC ministries, Government of Canada, other provinces, other governments and organizations, academic institutions and publications on specific issues and the industry.

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Other

BC AQUACULTURE R & D, A PROPOSED ORGANIZATIONAL AND PROGRAM MODEL
Prepared for BC Aquaculture R & D Steering Committee, by Science Council of BC
January 2001.

Report details recommendations for an organizational structure and framework to enhance innovation in aquaculture and provide a vehicle to direct investment that supports collaborative aquaculture R & D projects selected through a project review process. The study suggests that a technologically enhanced, diversified and sustainable aquaculture sector will make a significant economic contribution to coastal BC. It emphasizes the need to increase the available funding and to coordinate with existing initiatives and programs to support a sustainable industry for the future.

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ECONOMIC DEVELOPMENT

NORTH COAST COMMUNITY/REGIONAL DEVELOPMENT STRATEGY
Prepared for The City of Prince Rupert and the Tsimshian Tribal Council
By: E. Pucci & Associates, Prince Rupert, BC, March 2002.

Report presents an economic development strategy that builds on the resources, joint cooperation and initiatives of First Nations, non-aboriginal and business communities in the region based on a SWOT analysis. Profiles of communities, geographic features, historical and cultural resources provide background. Sectors identified as those with greatest potential for growth are: Oil and Gas Exploration and Extraction, Finfish Aquaculture, Shellfish and Seaweed Aquaculture, Manufacturing and Processing, Tourism, Transportation, Communication, Resident and Public Services, Arts, Culture and Recreation. Specific development strategies for each sector are discussed; roles and responsibilities of stakeholder groups are defined. The document includes an outline of a management system with provisions for monitoring progress and reporting. Appendix lists participants in the planning process.

WESTERN ECONOMIC DIVERSIFICATION & PACIFIC FISHERIES ADJUSTMENT, An Evaluation, Prepared for Western Economic Diversification, Ottawa, Ontario
By GSGislason & Associates Ltd., Vancouver, BC, Gordon Gislason, Edna Lam, Kyla Knowles, January 2002

Western Economic Diversification in partnership with coastal Community Future Development Corporations has been actively involved in Fisheries adjustment initiatives since 1997. This report evaluates the success, design and delivery of four interrelated fisheries adjustment programs sponsored by WED and delivered through CFDCs. These programs, developed to assist BC coastal communities affected by the downturn in the fisheries industry, were implemented to promote economic growth through diversification and business development. Evaluated are: Fisheries Legacy Trust Loan Program (FLTL), Community Economic Adjustment Initiative (CEAI), Outreach & Coordination Program (O&C) and, Recreational Fishing Loan (RFL). Information acquired through interviews and review of existing data. Includes case studies of six coastal communities: Masset, Prince Rupert, Alert Bay, Sointula, Ucluelet and Campbell River.

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INVESTMENT ATTRACTION OPPORTUNITIES IN THE MARINE SECTOR
Prepared for Vancouver Island Economic Developers Association, by KPMG Consulting, Victoria, BC, November 2000.

Report complements previous studies undertaken by VIDEA to develop a marketing campaign to attract new investment in the region. It identifies target industries, their characteristics and requirements, and presents a framework and action plan for communities on implementing a targeted marketing initiative. Industries identified are: aquaculture, marine equipment manufacturing, marine electronics, specialty vessel construction, water sports equipment manufacturing, marine research and tourism infrastructure. Appendices include bibliography with websites, list of interviewees, initial shortlist of target marine industries by NAICS and SIC codes.

ECONOMIC POTENTIAL OF THE BRITISH COLUMBIA AQUACULTURE INDUSTRY, Phase I - Shellfish, Phase II – Finfish, Prepared for Western Economic Development Canada, by Coopers & Lybrand, Vancouver, BC, 1997.

This report presents a comprehensive study on the potential for economic development of the aquaculture industries, shell and fin fish sectors. It profiles both sectors in the mid 90s and covers market potential, biophysical capabilities, productivity trends and economic potential of clam and oyster culture and finfish. Its conclusions state that the shellfish farming industry has the potential to become a significant food producer and exporter. On the basis of market trends, productivity increases and the estimates of capable lands, the sector could be a substantial contributor to the provincial economy. Findings on the finfish sector conclude that finfish farming has the potential to create 20,000 person years of employment; mostly in coastal communities and that the province has the capable aquatic land inventory to expand production. Bibliographic references and statistical data are included.

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FINFISH

HALIBUT & SABLEFISH AQUACULTURE IN BC: ECONOMIC POTENTIAL
Prepared for BC Ministry of Agriculture Food & Fisheries, by GSGislason & Associates in association with Archipelago Marine Research Ltd. Vancouver, BC, December 2001.

Report on the potential for economic development for halibut and sablefish aquaculture provides information to assist the Ministry in the development of new non-salmonid finfish policy. Reviews of market demand and economic impacts, technical and regulatory constraints and, lessons learned are included. Study involved structured interviews with seafood buyers and marketers, scientists, industry and academics in addition to review of existing reports and materials. Includes bibliographic references.

JOBS FOR OLDER WORKERS DISPLACED FROM THE BC FISHERY, FINAL REPORT
Prepared for Human Resources Development Canada, Vancouver, BC, by GSGislason & Associates Ltd., Vancouver, BC, (Gordon Gislason, Edna Lam), March 24 2000.

Profiles the older worker (55-65) displaced by restructuring measures or resource decline of the BC fishing industry. Information gathered through review of existing HRDC programs, existing literature and interviews with industry workers, government representatives and service providers/partners. Included in the report are personal stories and bibliographic references.

THE CENTRAL COAST OF BRITISH COLUMBIA: A FISHERIES PROFILE
Prepared for Canada Fisheries & Oceans, by GSGislason & Associates Ltd., Vancouver, BC Edna Lam and Gordon Gislason, February 28, 1999.

Report supports the planning process undertaken by the Province of BC and Fisheries and Oceans Canada for the Central Coast Land and Resource Management Plan. Provides a profile of the contributions made by the commercial, aquaculture and recreational fisheries to the economy of the Central Coast and outlines future trends and outlook for each sector. Included is bibliographic references and statistical information to support the study.

FISHING FOR DIRECTION, TRANSITION SUPPORT FOR BC FISHERMEN AND THEIR COMMUNITIES
Prepared for Canada Fisheries and Oceans, by GSGislason & Associates Ltd., Vancouver, BC, September 21, 1998.

Report prepared in response to the federal adjustment packaged announced in 1998 and its impact on fishery dependent communities. It describes a community consultative process involving local and aboriginal governments, industry groups, CFDCs and representatives from community organizations to identify common issues and constraints to economic development. Common themes that developed throughout the process are categorized in terms of needs and capabilities, red tape and regulatory inertia, information and

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coordination, local input and decision-making, new opportunities and resource management and, consultation, trust and action. Suggested initiatives are presented to address common issues and to act as a guide in implementing the adjustment and development package. Appendices include the survey conducted, summary of results and bibliographic references.

ECONOMIC DEVELOPMENT FOR COMMUNITIES IN TRANSITION: SELECTED NORTH AMERICAN EXPERIENCE
Prepared for Canada Fisheries and Oceans, by GSGislason & Associates Ltd., Vancouver, BC, September 16, 1998.

Document supports 'Fishing For Direction' study with case studies of communities in the province and the US Pacific Northwest. It highlights the efforts of Chemainus, Kimberly, Revelstoke, Nelson and communities in Washington and Oregon and their initiatives to build a sustainable economy. The report identifies 'success features' for economic diversification in addition to constraints to and strategy plans for community economic development.

FISHING FOR MONEY, CHALLENGES AND OPPORTUNITIES IN THE BC SALMON FISHERY, FINAL REPORT
Prepared for BC Job Protection Commission, by GSGislason & Associates, Vancouver, BC, June 10 1998.

This study updates the 1996 report to the BC Job Protection Commission, 'Fishing for Answers: Coastal Communities and the Salmon Fishery'. It analyzes the 1997 salmon fishing season and identifies challenges and opportunities for the future of BC commercial and recreational salmon fisheries. Key study areas include: financial viability of the fishery industries, long term outlook for each sector, socio-economic impacts on coastal communities, transition and adjustment programs and baseline data and mechanisms to assess future needs of the industry. Bibliographic references and appendices with terms of reference, interview list, sector data, projects and census data are included.

THE FISHERY OF BRITISH COLUMBIA, A PROFILE OF COMMERCIAL FISHING, AQUACULTURE AND RECREATIONAL FISHING SECTORS
Prepared for Fisheries Renewal Project Team, by Gordon Gislason, Edna Lam
October, 1997.

Profile of the commercial fishing, aquaculture and recreational fishing sectors with an overview of size, economic scope, key issues and trends faced by the sectors. Report includes bibliographic references and appendices of statistical data on the sectors: fishing fleet size, product, processing, farming, harvesting and related direct job employment.

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SHELLFISH

BEACH SHELLFISH AQUACULTURE IN BC: An Economic Profile
Prepared for BC Ministry of Sustainable Resource Management, by GSGislason & Associates Ltd, Vancouver, BC, 2002.

To support coastal and land use decision-making, this study profiles the economic scope and presents an overview of the beach shellfish aquaculture sector. Included is a description of the sector, coast and land resources, products, market, investment needs, workforce capacity, input output impacts. Bibliographic references are included.

SHELLFISH INDUSTRY ECONOMIC IMPACT ANALYSIS
Prepared for Vancouver Island Economic Development Association, New Marine Frontier Project, by Blair Salter and Daystar Marketing, Victoria, BC, December 2002.

Report builds on and updates information provided in 'Profile and Potential of the BC Shellfish Aquaculture Industry'. It cites the current shellfish industry as accounting for $66 million in economic output and estimates 950 jobs directly and indirectly attributable by the sector. Much of the economic benefit and impact felt in communities on Vancouver Island, Central and North coast. Report reviews the current state of the sector and outlooks for the future. Included are graphs and statistical data on industry segments, jobs, input-outputs and forecasts economic growth for the next 5-7 years.

FIRST NATIONS SHELLFISH AQUACULTURE REGIONAL BUSINESS STRATEGY, BC CENTRAL AND NORTH COAST
Prepared for Land and Water British Columbia Inc., Aboriginal Relations and Economic Measures, by Kingzett Professional Services Ltd., in collaboration with AXYS Environmental Consulting Ltd., Nanaimo, BC, November 2002.

Strategy and framework for development of economic measures to support First Nations entry into the shellfish farming industry on the Central and North coasts. Includes SWOT analysis and overview of requirements for sector development.

Presents 52 recommendations for regional coordination, project planning and environmental sustainability, joint ventures, economies of scale, compatibility with other industries, project management, linkages with non-aboriginal projects, business planning, business structure, joint ventures and capital investments, education and training, permits and licenses, species considerations, processing capacity, marketing, branding and product development.

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SHELLFISH AQUACULTURE BRAINSTORMING WORKSHOP: PROCEEDINGS, SUMMARY AND ACTION PLAN
Prepared by Ruth Salmon and Brian Kingzett, Kingzett Professional Service, Ltd., Nanaimo and Don Tillapaugh, Centre for Shellfish Research, Malaspina University-College, Nanamio, BC, August 2002.

Report on 2-day workshop held in June 2002, organized and hosted by the Centre for Shellfish Research. Attended by over 50 shellfish representatives from industry, government and academic institutions it served as a vehicle for collaborative industry planning over the next 5 year period. Process included a needs analysis of the industry identifying leadership, knowledge, economic opportunities, physical opportunities, environmental sustainability, marketing and production as key elements. The outcome of the workshop produced an action plan that would support industry growth and address: policy & regulatory development, leadership, R&D/Training, communications, marketing, environmental sustainability, food safety and business development. Action Plan is included as Appendix III and outlines the 5 year vision with strategies that, if undertaken, to transform the current sector into a world-class shellfish industry for BC.

PROFILE AND POTENTIAL OF THE BC SHELLFISH AQUACULTURE INDUSTRY
Prepared for Vancouver Island Economic Developers Association. Marine Frontiers Project By Kingzett Professional Services Ltd., Nanaimo, BC, June 2002.

Report on the current shellfish aquaculture industry which includes a comprehensive study of the industry: production techniques, trends, tenures and value; workforce and employment, economic contributions and impacts; global, national and provincial growth forecasts. Barriers to growth are identified and recommendations are presented to address constraints. Includes case study of New Zealand, recommendations and bibliographic references.

SHELLFISH AQUACULTURE IN BAYNES SOUND, Information Report
Prepared for BC Ministry of Sustainable Resource Management, by GSGislason & Associates Ltd., Vancouver, BC, April 26, 2002.

Report provides information to the Ministry to assist in developing the Baynes Sound Aquaculture Action Plan. Included is a socio-economic profile of the area, review of current shellfish aquaculture activity with recommendations on potential for growth.

ACTIVITIES AND POTENTIAL ENVIRONMENTAL EFFECTS ASSOCIATED WITH SHELLFISH AQUACULTURE IN BAYNES SOUND
Prepared for Ministry of Sustainable Resource Management, y Brian Emmett, Archipelago Marine Research Ltd., Victoria, BC, March 8, 2002.

With the objective of the Shellfish Development Initiative to increase provincial foreshore areas under shellfish aquaculture tenure, concerns have been raised in the Baynes Sound area as to the sustainability and suitability of expanding tenures due to potential resources use conflicts, environmental and wildlife conflicts and lack of consultation and compliance

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processes. This technical report addresses a component of the Baynes Sound Shellfish Aquaculture Action Plan and summarizes the potential effects of shellfish farming on the environment in Baynes Sound area and provides a method to assess the degree of potential impacts. Bibliographic references are included.

ECONOMIC POTENTIAL OF SEA RANCHING AND ENHANCEMENT OF SELECTED SHELLFISH SPECIES IN CANADA
Prepared for Office of the Commissioner for Aquaculture Development, by Gardner Pinfold, IEC International, Victoria, BC, June 2001.

Report assesses the potential economic impacts of culture-based fisheries defined as fisheries that culture shellfish or finfish to the juvenile stage for release and eventual harvest in open waters. It presents case studies of 9 shellfish species, direct, indirect and induced impacts on employment and gross domestic product. An overview of the Japanese experience with scallop culture is included. Appendices include case studies in detail outlining biophysical requirements, culture methods and assumptions and results.

WEBSITES

For copies of many of the reports described in this bibliography and for additional information, articles and publications, we suggest the following websites:

Federal Fisheries Act
http://canada.justice,gc,ca/en/laws/F-14
Fisheries Development Act

BC Fisheries Act
www.qp.gov.bc.ca

Fisheries and Oceans Canada-Pacific Region
www.pac.dfo-mpo.gc.ca

Office of the Commissioner of Aquaculture Development
http://ocad-bcda.gc.ca

BC Ministry of Agriculture, Food and Fish
www.agf.gov.bc.ca

BC Ministry of Competition, Science and Enterprise
www.gov.bc.ca/cse

BC Ministry of Water, Land and Air Protection
www.gov.bc.ca/wlap

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Land and Water British Columbia Inc.
www.lwbc.gov.bc.ca

Pacific Fisheries Resource Conservation Council
www.fish.bc.ca

BC Salmon Farmers Association
www.salmonfarmers.org

BC Shellfish Growers Association
www.bcsga.ca

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